Valero Houston Refinery Energy Program

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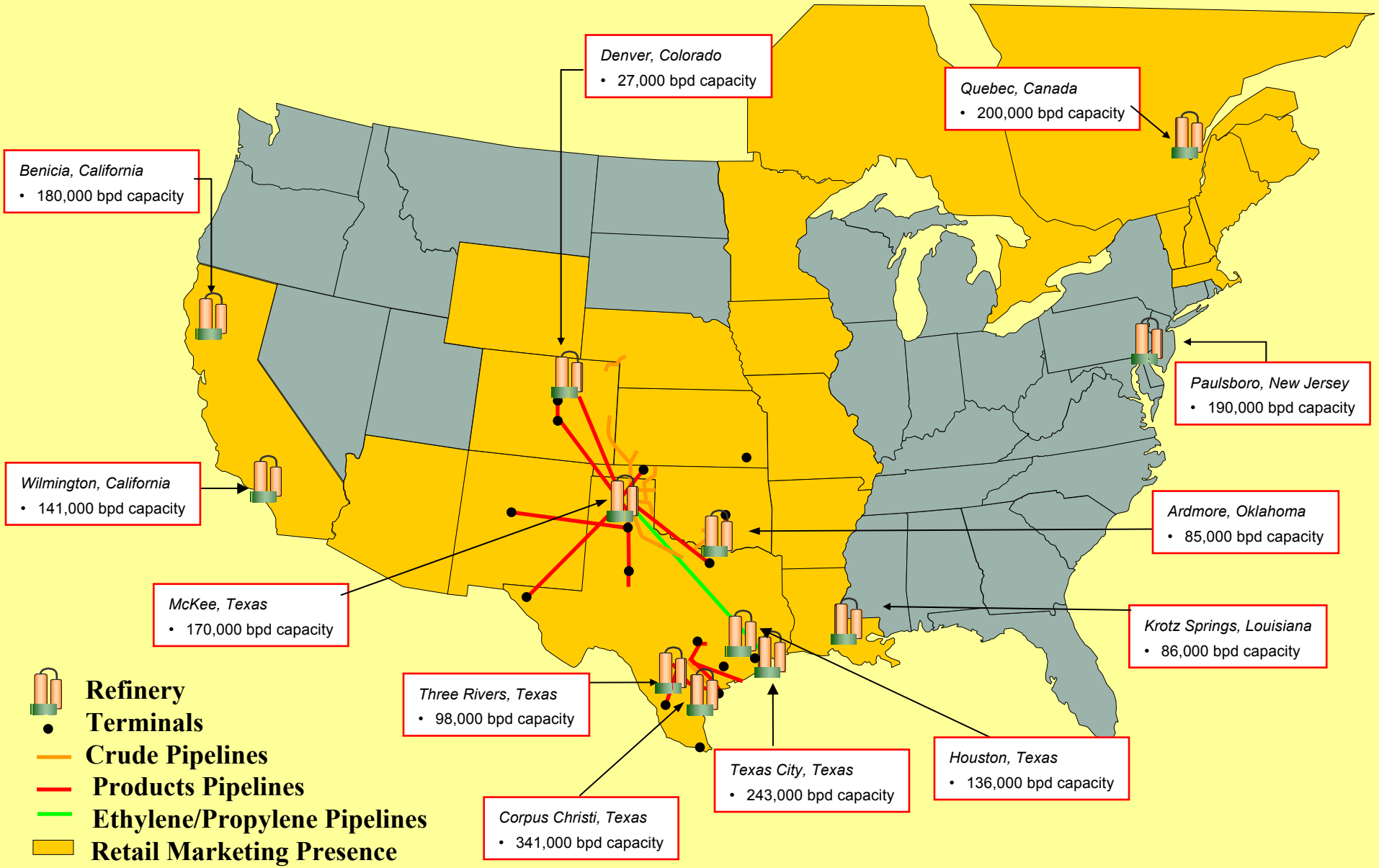
Energy & the Environment

- Introduction
- Houston Refinery History
- Technology Highlights
  - Aspen Utility Management System
  - Conmec Power Train System
  - Bambeck Low O2 Control System
  - Cogeneration & Other Technology
- Plans & Questions

Valero Refining System





Valero Houston Refinery History

- **First Built During WW2 to Support the War Effort**

- **Major Expansion in the Mid-50's**
  - **Petrochemical Complex**
  - **Naphtha Reformer**
  - **Distillate Hydrotreaters**

- **Existing 90,000 BPD Crude Unit**
  - **Built in Early Sixties**

- **Major Expansion in the Mid-70's**
  - **Existing 65,000 BPD FCC Unit**
  - **Solvent Deasphalting Unit (SDU)**
  - **200 TPD Sulfur Unit Capacity**



Valero Houston Refinery History

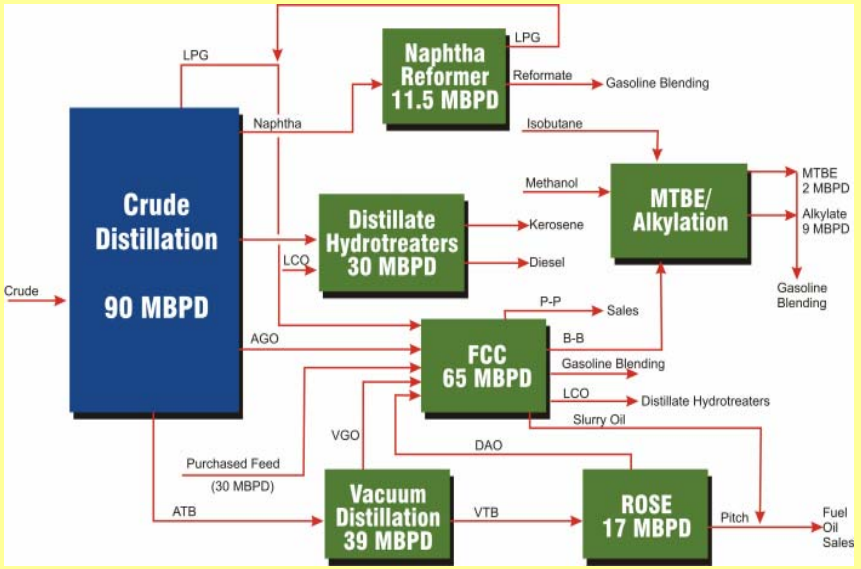
- **Other Additions in the Eighties and Nineties**
  - **MTBE Unit – 1981 (First Catalytic Distillation MTBE Unit)**
  - **Cogeneration Units – 1989**
  - **ROSE Unit - 1989 (replaced SDU)**
  - **Sulfur Unit - 1990**
  - **Alkylation Unit Expansion – 1991**

- **Future Challenges**
  - **NOX Nonattainment Area**
  - **Clean Fuels**
  - **Further Environmental Projects**




Valero Houston Refinery Statistics

- **298 Acres Located on Houston Ship Channel**
- **Employs Approximately 280 People**
- **Has Access to Local Terminals, Pipelines**
- **Has Ship and Barge Docks**
- **Capacity**
  - **136,000 BPD Capacity**
  - **90,000 BPD Sour Crude**
  - **30,000 BPD Resid Oil**



- **Major Products**
  - **Gasoline 60,000 BPD**
  - **Diesel 35,000 BPD**
  - **Fuel Oil/Asphalt 15,000 BPD**
  - **LPG 8,000 BPD**
  - **MTBE 1,800 BPD**

Crude Unit

3

Crude Heaters

5

VALERO ENERGY CORPORATION

Technologies

1. Refinery-Wide Energy Model
2. FCC Power Recovery Train
3. Crude Heaters Excess Air Control

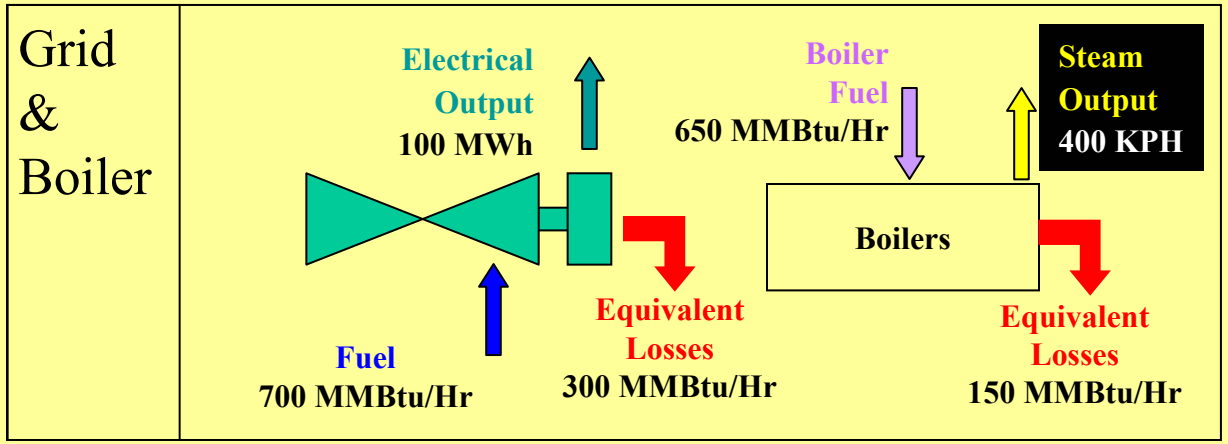
5

2

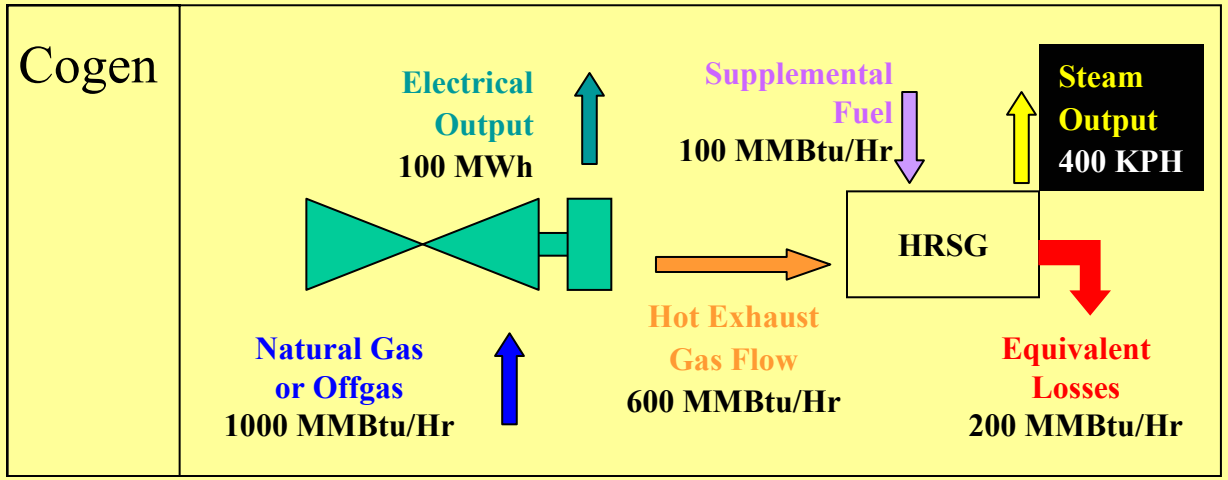
Bus Route

Cogeneration Provides Steam and Power for Valero's Refining Needs



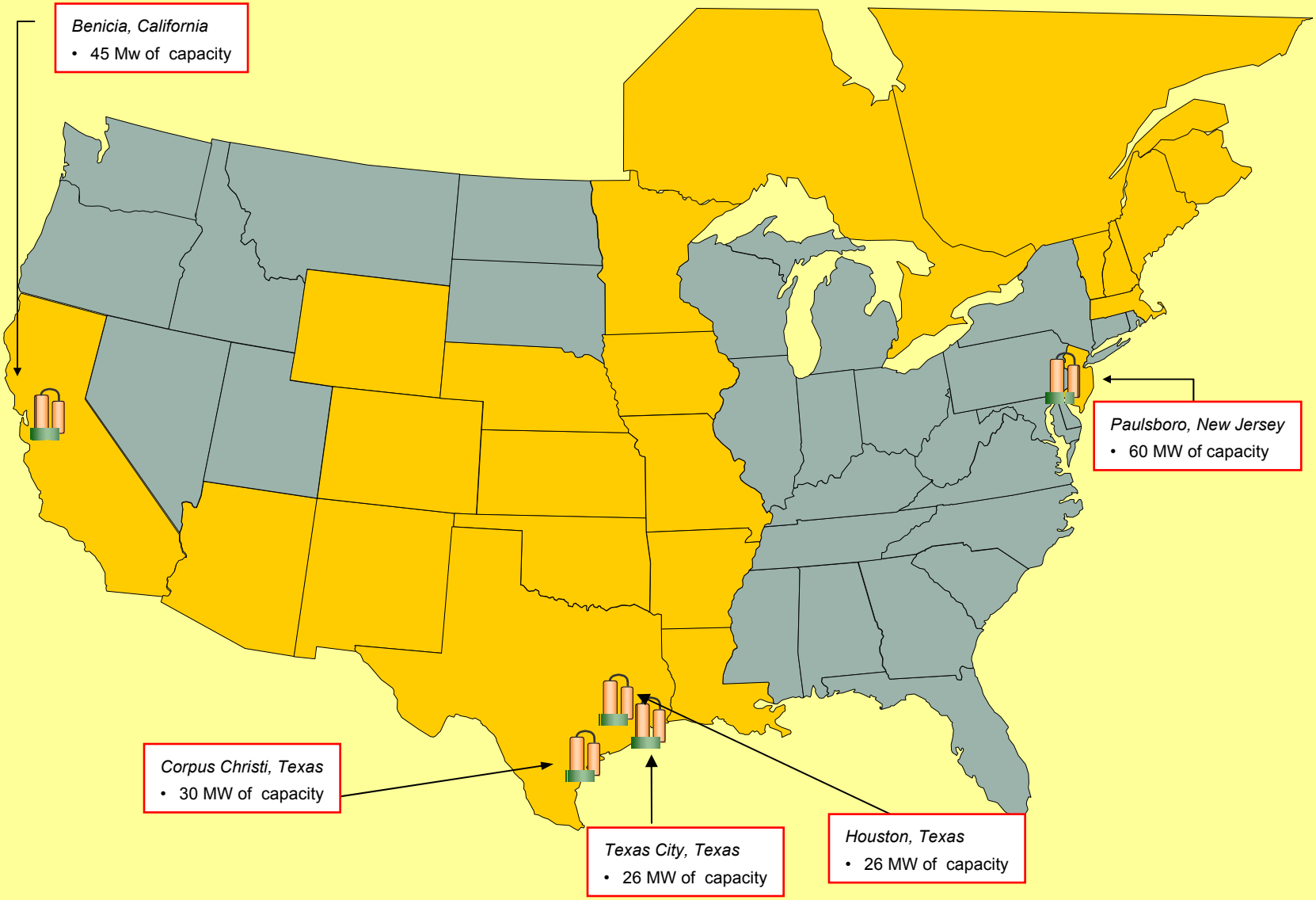


VS



Waste Heat Provides Steam Benefit and Increased Efficiency

Valero Refinery Cogeneration System

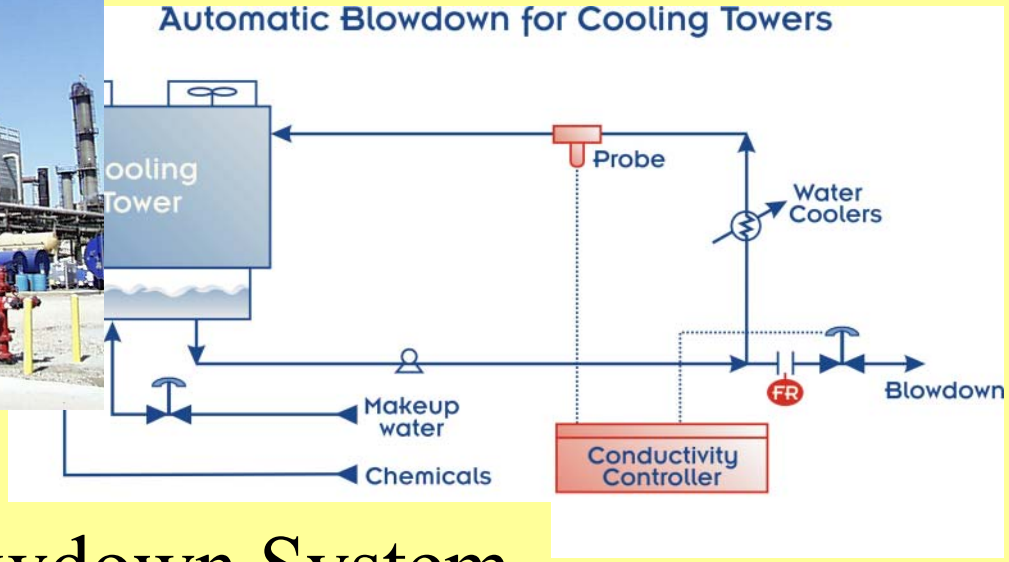


Current Cogeneration Is At Relatively Small Scale

Drivers for the Future of Cogeneration

- Consumption of Internal Produced Fuels
- Market Dynamics
- Environmental
- Fuel Efficiency
- Scale
- Reliability
- Self Sufficiency

Other Technology

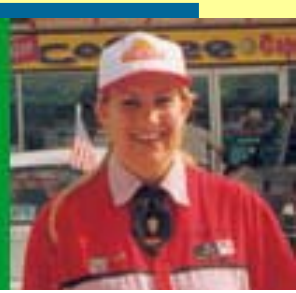


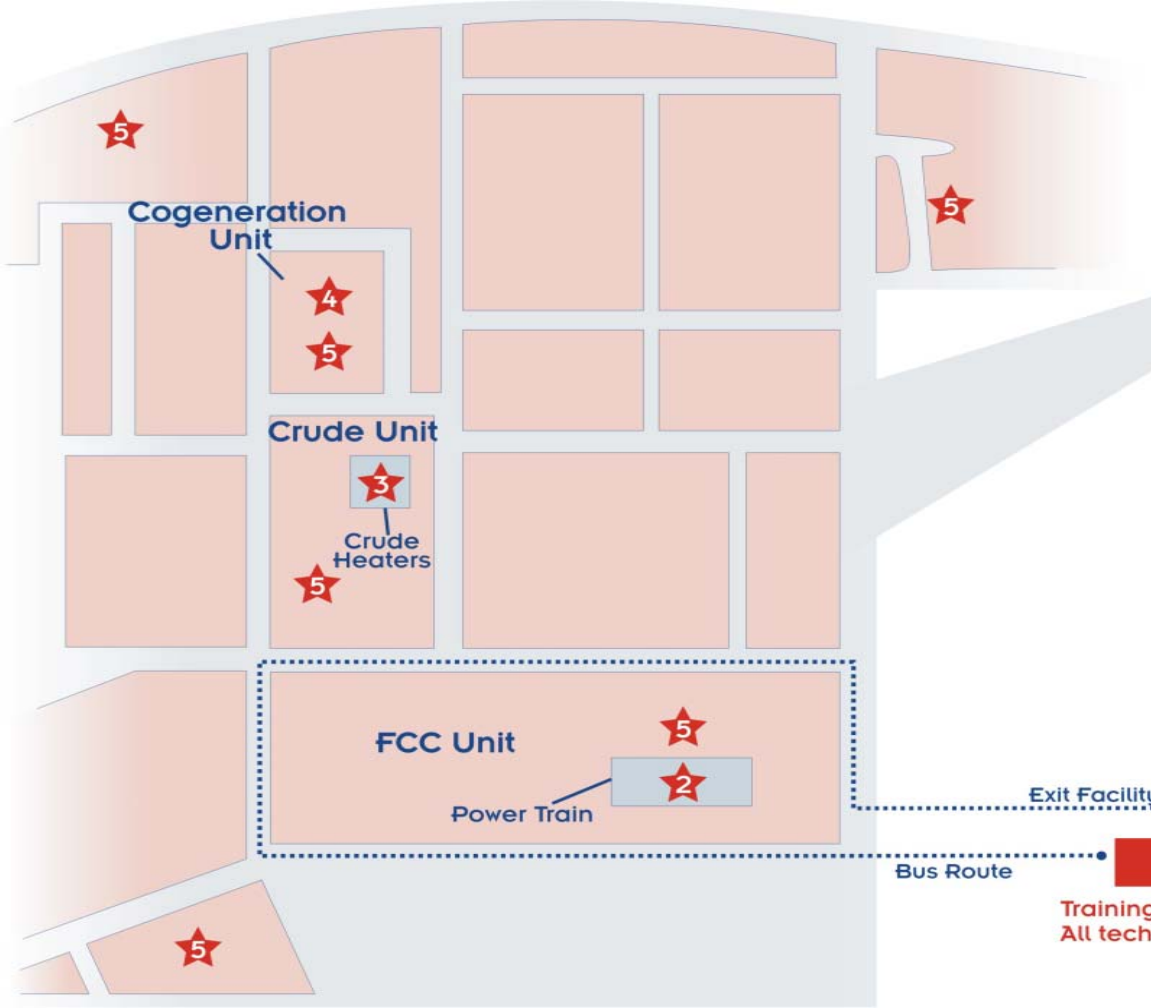
- Automatic Blowdown System
  - $300,000 per year in savings
  - More reliable system operation
  - Enhanced corrosion and fouling prevention control
- Ceramic Coating
- Exchanger Cleaning
- Active Distillation Monitoring

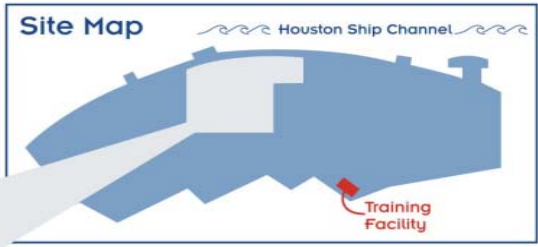
Plans & Questions











Technologies

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4. Cogeneration Unit
5. Automatic Blowdown Control